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ABSTRACT

This paper reports findings from a comprehensive evaluation of the first national electronic mentoring program that matches female engineering students with mentors working in industry. The program being evaluated--MentorNet--uses a combination of on-line tools, computer databases, mentoring specialists, and campus and industrial contacts to recruit, match, train, coach, and monitor bimonthly e-mail exchanges between women studying science and engineering fields and mentors working in engineering fields. The paper examines the effects of student-mentor matching algorithms, coaching, engineering field, and mentor and student attributes on a variety of outcome measures, including participant reports, the frequency and substance of communication, and students' interest in persisting in science and engineering. (CCM)

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Factors Related to Success in Electronic Mentoring of Female College Engineering Students by Mentors Working in Industry

by
William S. Carlsen
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Factors Related to Success in Electronic Mentoring of Female College Engineering Students by Mentors Working in Industry

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Objectives

The attached paper reports findings from a comprehensive evaluation of the first national electronic mentoring program that matches female engineering students with mentors working in industry. The program being evaluated--MentorNet—uses a combination of online tools, computer databases, mentoring specialists, and campus and industrial contacts to recruit, match, train, coach, and monitor bimonthly email exchanges between women studying science and engineering fields and mentors working in engineering fields. The paper examines the effects of student-mentor matching algorithms, coaching, engineering field, and mentor and student attributes on a variety of outcome measures, including participant reports, the frequency and substance of communication, and students' interest in persisting in science and engineering.

Significance

The significance of this study is twofold. First, the MentorNet project has a number of carefully developed components that should be of interest to NARST members, including its innovative use of technology for recruitment, matching, and monitoring; its successful development of partnerships with university-based women in science programs, foundations, and corporations; and its strategies for addressing problems contributing to the paucity of women in science and engineering fields. Second, the evaluation of the MentorNet project provides systematic quantitative and qualitative examination of the reported outcomes of mentoring and, through content analysis, an unprecedented look IN to the actual mentoring process. To date, evaluations of women in science and engineering programs have relied heavily on participant self reports, the validity of which has been unknown.

Theoretical Underpinnings

The general societal problem addressed by this project is the underrepresentation of women in science and engineering fields (Matyas & Malcom, 1991; NSF, 1989). One aspect of this problem is that although most postgraduate jobs in engineering are in industry, women studying engineering often receive mentoring only from academic engineers.

The mentoring model utilized in the MentorNet project has both traditional and innovative features. For example, it strives to provide information, guidance, and encouragement by carefully matching students with experienced mentors (AWIS, 1993; Brianard & Ailes-Sengers, 1994), and tests the assumption that greater awareness of opportunities in industry will increase retention in science and engineering (Cunningham, 1996). However, it also probes the unique potential of technology to encourage different, better forms of communication (Sproull & Kiesler, 1992) and to extend the mentoring process from one-on-one to participation in a larger

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community (Rheingold, 1993). The potential of electronic mentoring had been hinted at earlier in studies at the precollege level (Bennett, 1997) and at single universities (Char, 1996). This evaluation represents the first real test of the effectiveness of electronic mentoring at a national scale.

Design and Procedure

The evaluation of the first and second years of the program, reported in this paper, include analyses of midyear and yearend questionnaires, (consented) email monitoring of a sample of mentor-protege pairs, telephone interviews, and other data sources. Regression models were used to examine the effects of student-mentor matching algorithms, coaching, engineering field, and mentor and student attributes on a variety of outcome measures. The paper provides quantitative and qualitative descriptions of mentoring outcomes as reported by mentors and protégés, and as observed through content analysis of actual email traffic.

Findings

Detailed findings are appended to this summary. The 1998-99 cohort included over 500 pairs of mentors and protégés from over two dozen universities and over 50 different companies. The overall response rate to electronically administered midyear and yearend questionnaires exceeded 60%, and nonresponse bias was examined and ruled out through telephone followups of a random sample of participants. 25 pairs of mentors and protégés participated in an email monitoring substudy, and content analysis of actual email traffic provided good corroboration of participant self reports on questionnaires. Strong evidence was found for the efficacy of the mentoring process for most participants, using multiple outcome measures, and little evidence was found that mentoring success varied by campus, industry sector, student degree-year, and several other matching criteria, although extensive screening of applicants clearly contributed to some floor effects. Outcomes reported include both informational and psychosocial outcomes. The best predictor of variance in mentoring success concerned frequency of email contact. Interestingly, this variable remained a strong predictor even when "satisfaction with the frequency of email contact" was controlled for, suggesting that efforts to stimulate more frequent contact may lead to greater mentoring success.

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MentorNet 1998-99 Evaluation Report

A report for

MentorNet

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EXECUTIVE SUMMARY

The MentorNet program pairs undergraduate and graduate women who are considering careers in engineering and science with mentors who work in science/engineering industries. Mentors and protégés apply to the program, are matched by MentorNet staff, and then communicate for at least one academic year using email. In 1998-99, 515 pairs from 25 schools and more than 200 companies participated in the program.[1]

The evaluation for the MentorNet project in 1998-99 was goal-oriented, concentrating on explicit and implicit program goals concerning the mentor-student process. Evaluation activities included midyear and year-end web-administered questionnaires with an email and telephone survey follow-up of non-respondents to gauge bias. Unobtrusive (but consented) monitoring of all email traffic among a random sample of participants was also conducted. Other evaluation activities included meeting with the project Advisory Board and key project staff, reviewing information on the recruitment and matching process, analyzing the MentorNet electronic discussion lists, and reviewing newsletters and other data sources.

This report summarizes analysis of MentorNet-provided and Ithaca Evaluation Group (IEG)-acquired data. Analyses include generation of baseline statistics, assessment of factors related to satisfaction with mentor-protégé matches, and inspection of outcome measures for differences related to student degree program, matching, and university. Content analysis of email communications and questionnaire free-response items was done using a coding system developed during the 1997-98 year.

Participants' assessments of their mentoring relationships are very positive. On a five-point scale (1-5), participants responded very favorably (>4) to queries concerning the comfort asking and answering questions of their mentoring partner, their post-mentoring interest in their major, their post-mentoring interest in working in industry, their willingness to recommend the MentorNet program to others, and their perceptions of their mentoring partners' interest in them. Mentors indicated strong interest in participating in the program again next year.

Analysis of the frequency of email communication reveals that email exchanges were more frequent earlier in the year. Frequency of email initiation is a significant predictor of overall mentoring success--strong positive correlations exist between reported frequency of email contact and mentor and student satisfaction with the match. This relationship holds even when satisfaction with frequency of email contact is held constant.

To stimulate mentoring exchanges and remind participants to remain in contact, MentorNet's mentoring specialist periodically provided email prompts. Part of our analysis focuses on the perceived utility of this prompting by participants. Although both groups had favorable responses overall, we did find differences between mentor and protégé responses, with a discrete minority of mentors reporting that they were unnecessary. We suggest experimenting in 1999-2000 with an adaptive prompting system to provide explicit coaching to some mentors only when it is requested or its need is identified.

The evaluation found few differences between male and female mentors with respect to outcomes—they report comparable levels of email traffic, similar satisfaction with quality of matches, and similar ratings of most other outcomes. Three differences surfaced in relation to discussion topics: half as many male mentors reported discussing their future career plans as did female mentors; female mentors were twice as likely as male mentors to discuss the treatment of women at their company; and students with female

[1] 539 protégés from 26 schools were initially matched; 24 formally discontinued their participation during the year.

mentors were more likely to report that they discussed "balancing career and life" than students with male mentors. For most conversational topics and other outcomes, however, there were no observed differences that were related to mentor gender.

On the midyear and final questionnaire, participants were asked about the content and value of their email exchanges, using both topic checklists and free-responses (essay) questions. More than 75% of participants discussed their backgrounds, the mentor's job, college life, and the protégé's career plans. Most questionnaire respondents also discussed social interactions and/or jokes, the industry workplace, balancing career and life, managing time and/or stress, and job hunting and/or interviews.

Three open-ended questions asked mentors and students to identify the most useful topic they discussed, the most valuable aspect of email monitoring, and the positive outcomes of the mentoring experience. Detailed analysis of these responses and of actual email traffic (received through email monitoring) generated a number of content themes underlying ementoring.

a) Impartiality. One key feature of ementoring is that it provides protégés with an opportunity to ask questions of an impartial person. Many of the mentoring relationships develop an atmosphere in which the mentor is a confidante who is "safe" to bounce ideas off or to whom one can air insecurities or other concerns. For example, one student commented, *"The most valuable aspect was being paired up with a complete stranger and getting to know their life, as well as them getting to know you. It was valuable to me to be able to go to a neutral person on work place, scholastic, and personal matters."*

b) Personal relationship and encouragement. Personal interactions associated with mentoring surface in student reports as another of the most valuable aspects of mentoring. Students' identify different aspects of their relationship as being particularly valuable at different stages of their college careers. Freshmen emphasize the encouragement they receive from their mentor, while seniors appear to view their ementoring relationships as the starting point of professional networking. One student commented, *"This (ementoring) reaffirmed my belief that I want to be an engineer. It helped me to decide that working in industry would be good, and when I was feeling bad because of school or whatever she (my mentor) gave me encouragement."*

c) School matters and coursework. Students who are at the beginning of their college careers are most likely to find discussions of school matters useful. Often, mentors' comments about their similar difficulties with coursework in college help students persist: *"She (my mentor) was very helpful ... with difficult classes, such as chemistry. She encouraged me and reminded me that it was an introductory course that was meant to weed out the people who aren't serious about science majors. Her positive comments and the way she related my situation to her college experience helped me to succeed in that class."*

d) Job workplace & skills. Learning more about mentors' jobs and workplace environment is the first or second most frequently mentioned topic by freshmen and sophomores in all three free-response questions. This category includes understanding what skills mentors used in their jobs, balancing a career and family, and mentors' perspectives on women in the science and engineering workplace. One protégé commented, *"I found to be most helpful the duties my mentor had at her job. Industrial Engineering is so broad, it was good to hear some specifics. It also helped me to learn which classes, my mentor actually USED on the job."* Another protégé wrote, *"I feel better about becoming a female engineer, as it is a male oriented environment. I am more certain that the path I am choosing to succeed later in life and career is correct."*

e) Job hunting, future plans, and careers. Many students are curious about what the real world of engineering in industry entails and appreciate the chance to learn more about life after school from their mentors. Not surprisingly, as student progress through college, more and more of them identify future plans and careers as useful topics of discussion. Students commented on the helpful advice that

they received about interviewing--*"Some tips that I received for interviewing helped me to get a really good internship offer"*--and about preparation to enter the engineering workforce--*"I am more aware of what to expect from my new job and career path. I know I am not alone...."*

f) Self-confidence. One program outcome cited by students is the impact of the mentoring process on their self-confidence. This is an important finding because low self-confidence has been identified as one of the key factors that contributes to women's exodus from engineering and other scientific fields. One junior wrote, *"I gained a great deal from this e-mentoring experience. For one, I learned to think more positively about myself and be more confident in my abilities. I learned that failure will happen, but you have to get up one more time than you get knocked down to succeed. Most importantly, I've gained a true role model in my mentor. My mentor is the first female engineer I've met. She's everything I've aspired to be and more."*

Mentors identify different positive outcomes and valuable aspects than do students. Their responses indicate that they participate because they are committed to helping women students in engineering and science and are willing to share their knowledge and experiences. Positive outcomes reported by mentors included the satisfaction of being helpful, sharing knowledge, acting as a sounding board for students' ideas, and helping their protégés work through personal problems. Interestingly, mentors frequently stated that participation in the program helped them to improve their interpersonal skills. For example, *"This experience helped me to explore my leadership potential since I was able to guide, listen, help and assist someone not only in the academic and professional aspect but also the personal aspect."* The mentoring process also gave experienced scientists and engineers the opportunity to examine their own career decisions and aspirations.

Overall, evaluation data indicate that the project had a very successful first full year of mentoring. MentorNet achieved a 280% increase in participation relative to 1997-98 while simultaneously enhancing mentors' and protégés' mentoring success. The program seems to be well positioned for the 1999-2000 program which will entail another scale-up of similar magnitude.

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THE MENTORNET PROGRAM

Program Mission

Recent studies show that disproportionate numbers of women start but fail to complete engineering, science, and math degrees; or women complete these degrees but fail to go on to successful careers in their chosen fields. As a result, women remain underrepresented in today's workplace in such fields as science and engineering. The mission of MentorNet is to increase the number of women who graduate with engineering, science, and math degrees. Ultimately, the mission of the project is to improve the status of women in society, and to help women to contribute to society at their full potential.

Program Goals

MentorNet's immediate goal is to match women who are considering careers in science and engineering with mentors who are already employed in business or industry. The expectation is that with support and inspiration from a successful role model—and with the helpful information that a mentor can provide about the job-search process and the workplace environment—women will be more likely to choose and ultimately be successful in scientific or technical careers.

Given that the goal is to support women who are considering technical careers, it is fitting that the MentorNet goal is achieved through advanced technology. Traditionally mentor-protégé relationships have involved personal contact, face to face: for example, a professor mentors a student, or an experienced employee mentors a new hire. MentorNet takes a revolutionary approach to the mentoring process by transcending the limits of geography. Specifically, mentoring takes place on-line, via email correspondence, also called "ementoring." This arrangement allows women students to be paired with the most suitable mentors regardless of the location of either party. Ementoring also makes frequent communication convenient and easy to fit into busy schedules. Finally, preliminary results suggest that protégés appreciate the privacy of ementoring. The impersonal nature of correspondence as opposed to conversation may facilitate discussion of difficult or sensitive topics.

Program Objectives

Ementoring is a new practice. Thus one express objective of the project is to identify "what works" and what doesn't—to establish the best practices in ementoring. Members of the MentorNet staff support the development of the mentor-protégé relationship in various ways; for example by providing suggested topics for discussion. Evaluation of the project is ongoing.

As the program helps to develop and define the mentoring experience, it also aims to help the protégé move from dependence to independence. The objective is for the student to take away from the ementoring experience the skills, knowledge, and confidence to establish independently other mentoring relationships in the future.

Another objective is to expand the project's scope. MentorNet served about 500 students in 1998-99; it aims to serve 1,500 students by the third year of operation with the expectation of continued growth after that.

Program History

Carol B. Muller, the founder and executive director of MentorNet, first began to develop the concept of ementoring in 1990. At the time, she was the associate dean of the Thayer School of Engineering at

Dartmouth College and co-founder of the campus-wide Women in Science Program (Dartmouth WISP). This innovative program aimed to promote the retention of undergraduate women in engineering.

One activity that Muller organized for WISP participants was a visit to the IBM business campus in Burlington, Vermont, where students met with industry professionals and discussed career opportunities. Muller noted that just a few hours' interaction with role models in their chosen field had a significant impact on these students. Meanwhile, back on campus, WISP staff members were using the then-novel technology of email to communicate with student participants, organize events, and offer informal on-line mentoring. Muller recognized that email had the potential to link students not just with project staff and peers but with professionals in their chosen field.

In 1995 Muller discussed her ideas with John Vergelli of IBM, a fellow member of the board of the Women's Engineering Program and Advocacy Network (WEPAN). With his encouragement, she planned a two-year pilot program that was launched at Dartmouth College. Key financial support for the pilot came from the AT& T Foundation with additional funding from IBM and Creare.

The first year of the pilot produced encouraging results. With a grant from the Alfred P. Sloan Foundation, strategic planning for expansion to a national program ensued. Grants from the AT&T and Intel Foundations made the plan a reality. The pilot semester for the national program began in February of 1998.

MentorNet expanded in the 1998-99 academic year, thanks to funding from the U.S. Department of Education, AT&T, Intel, IBM, Microsoft, Hewlett Packard, the IEEE Foundation, SPIE, and Texaco.

Future Plans

For the 1999-2000 academic year (the third year of the project), MentorNet aims to double its reach, pairing 1000 students with 1000 mentors. Target numbers of students and mentors grow to 1,500 in year 4 and 2,500 in year 5.

MentorNet also envisions expanding its basic program (ementoring for women engineering and science students) through a number of related initiatives:

On-line Discussion Groups. During the 1998-99 program year, students who expressed interest in the program but could not be matched with mentors were invited to join in electronic group discussions along with protégé-mentor pairs. This format allowed the program to support a larger number of students than would otherwise have been possible with the existing pool of mentors. The success of the chat sessions suggests that this format is well worth continuing and expanding.

MentorNet 3C—The Community College Connection. With a grant from the U.S. Department of Education, MentorNet will begin work in 1999-2000 to plan for the 2000-01 launch of a mentoring program to serve community college students

Global MentorNet. Increasingly, businesses operate within a global rather than a national framework. The expansion of MentorNet beyond the borders of the United States to serve a global student population is a logical next step.

Other Ementoring Initiatives. Once a sustainable infrastructure is secured for the target population of women students in engineering and science, the program could be extended to students who are preparing for other careers where women are underrepresented, such as business and economics. MentorNet has received numerous requests to develop mentoring relationships for women in high school and plans to

explore this option. And women are not the only population that might benefit from ementoring; a similar program could help to serve the needs of minority students or young professionals.

MentorNet has found that the program is already garnering international notice. In the first six months of the program, staff were contacted by 75 different colleges and universities interested in having their students participate. The ultimate goal is to create a program that serves all eligible students, regardless of location.

Stakeholders

A variety of stakeholders contribute to and benefit from the MentorNet project. Corporations, college and universities, professional societies, and government sites interact with project staff. Stakeholders who are concerned about recruiting female scientists and engineers to careers in industry underwrite the project with financial and personnel resources. Although an in-depth exploration of stakeholder goals is slated for the 1999-2000 evaluation, this year's evaluation results speak to some of the likely goals. For example, the evaluation assessed students' interest in continuing their current majors and in working in industry after graduation. It also collected information about topics discussed during the mentoring interactions, particularly those related to understandings, skills, and issues in industrial workplaces. Data from the open-ended response questions indicate that throughout their college careers, students are hungry for information about the "real world" of engineering, use advice about conducting a job or internship search, and find descriptions of the skills needed in the workplace and their mentors' career trajectories encouraging.

Initial results also indicate that stakeholders may benefit not only from the development of more industry-savvy students, but also from the mentoring experiences of their employees. Mentors frequently commented on the positive impact of their participation on their own leadership and mentoring skills, and reflected about their past and future career goals. Furthermore, stakeholders profit from the knowledge that their employee mentors gain about the concerns and insights of current college students.

Universities represent another important stakeholder group. The MentorNet project potentially provides a mechanism for communicating timely information to university faculty, staff, administrators, and alumni—as well as students!—about the world of work beyond the campus grounds: information about the opportunities and challenges that graduates will face, the workforce skills they will need, the mistakes they should avoid, and the important problems that demand scientific, technological, and managerial skills from every graduate.

Evaluation Goals and Design

We took a goal-oriented approach to evaluating the MentorNet program in 1998-99, concentrating on explicit and implicit program goals concerning the mentor-student process: Did the program achieve its targets with respect to recruitment, matching, and successful mentoring? What did participants discuss, and what were the effects of those discussions, positive and negative, anticipated and unexpected? Did certain groups (e.g., students approaching graduation, or students at certain colleges and universities) benefit more from mentoring than others? What factors contributed to successful mentoring? We also looked at a new MentorNet initiative, which used electronic discussion groups to support multi-person conversations on topics of interest to participants, including applicants to the mentoring program who could not be matched in 1998-99. Our evaluation had both formative and summative components, emphasizing the former; that is, the primary function of our evaluation work was to provide information

to assist the MentorNet program as it develops.[2] For this reason, we tried to focus on issues that might help the program as it grows (e.g., examining the importance of closely matching protégés and mentors), rather than on tracking the program's long-term effects, a goal for future evaluation.

We did not address some evaluation objectives that we had proposed for 1998-99, largely because we had not anticipated how time-consuming certain technical challenges of electronic data collection would be. Unrealized objectives were (1) carefully reviewing certain project logistics (e.g., how participants are selected at the various campuses and workplaces, and how long it takes for ementoring matches to be made and communications initiated) and objectives, through interviews of stakeholders, and (2) telephone interviewing a sample of participants, including individuals whose partnerships did not last the entire year. MentorNet program staff have many insights about these issues, and evaluation work for the coming year will return to these objectives.

The principal data collection methodologies of the evaluation were (a) participation by the evaluators in some strategic planning activities among key project personnel; (b) unobtrusive (but consented) monitoring of all email traffic among a random sample of participants, with an analysis of frequency, timing (e.g., lags between queries and responses), and content; (c) web-administered mid-year and exit questionnaires, completed by project participants; and (d) an email and telephone survey of a sample of participants, to gauge nonresponse bias.

Questionnaires

Outcomes questionnaires were administered to students and mentors using simple web-based forms served from the evaluators' internet service provider. Two different questionnaire rounds were administered: a mid-year questionnaire (which served questionnaires February-March) and a final questionnaire, served from April-June.[3] Mentor and protégé questionnaires were similar, as were midyear and final questionnaires, to facilitate comparison of results; for the same reason, we reused a number of items from the 1997-98 questionnaire. A sample questionnaire (the Student Final Questionnaire) is reproduced in Appendix B.

Participant questionnaires were intentionally brief and took an estimated 5-10 minutes to complete. Respondents were asked to estimate the number of mentoring messages per month they sent and received, and were queried concerning their comfort asking and responding to questions, interest in participating in MentorNet again, interest in recommending the program to others, assessment of some specific potential problem areas (delays in sending and receiving messages, difficulty discussing particular topics) and ratings of various measures of project effectiveness (e.g., mentor's interest in the protégé, participants' interest in meeting each other, and assessment of the overall quality of the mentor-protégé match). In addition, protégés were queried about their interest in continuing in their current major and their interest in working in industry following graduation. With the exception of the estimated number of messages sent and received, the quantitative measures used a five-point Likert scale ranging from strongly positive to strongly negative. The direction of the items was varied.

We received usable midyear questionnaires from 335 mentors and 197 protégés (an overall response rate of 49.4%), and usable final questionnaires from 348 mentors and 262 protégés (an overall response rate of 56.7%). At least one reminder was issued to nonrespondents to each survey, unless they notified us that they did not wish to participate (this required replying to the solicitation letter). Using the final tally of

[2] Summative evaluation, in contrast, is typically done at the end of a mature, relatively stable program and gauges whether or not it was successful.

[3] Responses were solicited in January for the midyear questionnaire, but the questionnaire was left online through three sets of reminders (two for protégés and one for mentors). Solicitations for the final questionnaire were staggered from April through late May, depending on when the protégé's school year ended.

515 pairs, the final questionnaire response rates are 67.6% for mentors and 50.9% for protégés. There were no significant differences in student or mentor response rates related to student degree program or year of study.

The process we used to solicit questionnaires is described in technical note 1, Appendix A.

In August 1999 we conducted a followup check to gauge nonresponse bias to the 1998-99 online questionnaires. Details on the nonresponse followup study are included in technical note 4, Appendix A. Nonresponding mentors reported comparable levels of email exchanging with their protégés, and slightly (but significantly) lower ratings of the overall quality of their matches. Other analyses of nonresponse bias suggest that respondent means may overestimate nonrespondent means by 15-20%.

Email Monitoring

During 1998-99, experimental email monitoring was conducted for a subset of the mentoring pairs to better assess the content of the mentoring process. 114 pairs were asked whether we could "observe" their conversations, via a personalized email message (a sample letter is included in Appendix C).[4] After a couple of weeks, we sent reminders to nonrespondents, tailored to their status (for example, if the protégé had consented but the mentor had not responded, we noted this in our followup letter to the mentor). For 26 pairs we obtained consent from both partners (23% consent rate), at which point we sent both partners instructions for copying us, with several different options (e.g., CCing us manually, setting up an outgoing mail filter, forwarding messages to us in batches). Over the rest of the academic year, we received multiple cc'd emails from 22 of the pairs, an 85% rate. Analysis of email traffic is based on the 155 messages that we received from these pairs after consent was granted.[5]

Primary analysis of the email messages was done using the qualitative methodology of constant comparative analysis. Thematic codes that had been generated from an analysis of self-reported topics of email discussion during the 1997-98 pilot year. We modified our codebook slightly in 1998-99 as new themes emerged during the analysis. We also consolidated our coding scheme into a single set of codes. In 1997-98, we used a 3-section coding scheme (one section corresponding to each of the free-response questions on the 1997-98 final questionnaire); because there was a great deal of overlap between the three sections, we were able to combine them for this year's analysis.

Online Discussion Groups

MentorNet staff organized a series of electronic discussion groups (a.k.a. "listservs") in 1998-99, in part to accommodate students who applied to the program but for one reason or another were not matched with a mentor. 419 mentors and students subscribed to one or more of the groups, and one third of them posted to a discussion group at least once. MentorNet staff and IEG collaborated on a content analysis of message traffic; this analysis is summarized later in this report.

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[4] We queried all 114 students enrolled at universities where Human Subjects approval for the email monitoring study had been granted, as well as their mentors.

[5] Anticipating that some participants might forget or encounter technical problems in forwarding us email, we had intentionally sent CCing instructions to BOTH partners. Because many emails included a copy of the partner's prior message—"you said, and my response is"—the actual number of discrete messages that we mined from those 155 emails was actually higher (about 200).

FINDINGS

General Findings

In 1998-99, 515 pairs of protégés and mentors were matched and completed a year of ementoring, a 280% increase relative to 1997-98. This is an ambitious rate of growth which the program seeks to match in the coming year, when it will strive to identify and support 1000 ementoring pairs from 35-40 colleges and universities. Results from this year's evaluation suggest that the current rate of growth has been achieved while simultaneously enhancing mentors' and protégés' mentoring success.

This section begins with a brief look at some participant-reported outcomes, followed by summaries of the relationship between some participant characteristics (gender, ethnicity, industrial sector) and mentoring outcomes. Later sections of the report focus more closely on the nature of the mentoring process, its content, and other factors.

Responses to several illustrative mentoring related questions (asked on the 1998-99 final questionnaire) are summarized in the following table, using a five-point scale ranging from 1-5. Mean responses were positive for all measures, for both students and mentors. Participants responded very favorably (>4.0) to queries concerning their comfort asking and answering questions of their mentoring partner, their post-mentoring interest in their major, their post-mentoring interest in working in industry, their willingness to recommend the MentorNet program to others, and their perceptions of their mentoring partners' interest in them. Mentors indicated strong interest in participating in the program again the next year. Of the 12 metrics in the table, 11 are increases compared to the 1997-98 pilot year, attesting to improvements in the program and/or the value of the longer mentoring period experienced by this year's participants.

Participant Assessment of Aspects of Mentoring Relationship

Outcome Measure	Student (mean)	Mentor (mean)
Comfort asking questions	4.45	4.32
Comfort answering questions	4.55	4.64
Interest in staying in major	4.31	n.a.
Interest in participating in MentorNet next year	n.a.	4.20
Interest in promoting MentorNet program	n.a.	4.21
Interest in working in industry	4.17	n.a.
Confidence in one's own major/mentoring skills	3.49	3.70
Overall quality of match	4.01	3.65

Scales are adjusted so 5 = highest (most positive) possible choice.
n.a. = "not applicable"

Constructed Outcomes Measures

To examine the effects of matching, participant demographics, email frequency, and other factors on the mentoring process, we constructed a set of outcome measures from information provided by respondents to the final questionnaire. After consultation with MentorNet staff, we decided to focus our analysis on four principal measures of mentoring "success": an informational construct (built from measures that probed what participants talked about and how useful that was), a psychosocial construct (built from measures that assessed interpersonal effectiveness and affective and social outcomes), a general construct (which gauged issues related to mentoring logistics and participants' future goals), and an overall construct (which summed the preceding three measures). Details about the construction of these measures

are included in technical note 2 (Appendix A). Another "outcome" we frequently consulted was participants' assessment of the overall quality of their match, as reported on the final questionnaire.

Protégés and mentors were asked how frequently they communicated and whether they had experienced delays in either sending emails or hearing back from their mentoring partners. When protégés and mentors are compared, differences are seen: protégés self-reported higher rates than did mentors; however both groups reported that protégés received more emails than they sent. Furthermore, both groups reported that delays were more common at the protégé-sending end--the inverse of the pattern observed last year, when response-delays were more common for mentors.[6]

Participant-Reported Frequency of Email Communication, Final Questionnaire

Outcome Measure	Student	Mentor
Number emails sent per month	2.64	2.17
Number emails received per month	2.68	1.89
Delays sending email (1=never, 5=frequent)	3.14	2.64
Delays receiving email (1=never, 5=frequent)	2.70	3.52

Contrast the preceding table with the following table, which shows responses to the same questions midyear. Not surprisingly, earlier in the year, exchanges were more frequent.[7] If one examines the diagonals in the bottom half of each table, another change between midyear and year-end is evident. In the fall, delays in responding to emails were more frequently attributed to mentors. By spring, it appears that students and mentors had both adjusted their expectations about how responsive mentors could be to student emails, and both more commonly attributed delays to students. Midyear, both groups reported that mentors sent more messages than they received; by year-end, students reported comparable sends and receives; mentors indicated that they were writing 13% more often than they were hearing from their protégés.

The frequency of email initiation merits this type of close inspection because it is a significant predictor of overall mentoring success.

Participant-Reported Frequency of Email Communication, Midyear Questionnaire

Outcome Measure	Student	Mentor
Number emails sent per month	3.65	2.93
Number emails received per month	3.78	2.70
Delays sending email (1=never, 5=frequent)	3.18	3.60
Delays receiving email (1=never, 5=frequent)	3.63	2.90

A strong positive correlation exists between reported frequency of email contact and mentor and student satisfaction with the match, as well as between frequency of contact and the psychosocial, informational, and general outcomes constructs that are described in Appendix A, Note 3. These relationships were explored through correlational analysis and regression models, and are included and annotated in the accompanying SPSS output file, "Mnet_9899_tables.spo", in the section titled, "DYNAMICS OF

[6] The numbers and the response pattern described here are unchanged if one regenerates the numbers using only mentors and protégés whose partners also completed the questionnaire. Consequently, it is unlikely that the asymmetry in responses is attributable to the different response rates of mentors and protégés.

[7] The declines in reported rates of sending emails from midyear to year-end were a very similar 28% for students and 26% for mentors (for students, for example, this represents a decrease from 3.7 emails sent per month to 2.6 per month).

MENTORING." One interesting aspect of the relationship between email frequency and outcomes is that the positive correlation holds even when one controls for participant satisfaction with the frequency of email contact. Short of an experimental manipulation (in which some participants are told to correspond more or less frequently) this is probably the best evidence available that email frequency may be causal, not just a correlate of a well functioning mentoring relationship.

Participant Evaluation of Usefulness of Email Prompts

On the midyear questionnaire, mentors and students were asked, "Have the email prompts from MentorNet been useful in stimulating discussion?" We read and recoded the responses to this open-ended question as "not helpful," "somewhat helpful," and "helpful or very helpful." The results are shown below.

	Usefulness of email prompts			
	Not useful	Somewhat useful	Useful /very useful	Total
Mentor	32.5%	16.5%	51.1%	100.0%
Protégé	28.1%	37.8%	34.1%	100.0%
Total	**30.9%**	**24.3%**	**44.8%**	**100.0%**

For above table, Mentor N=231, Protégé N=135. Note that these are recodings of essay-type responses.

Mentors and students responded differently to this question. Although more than two-thirds of respondents found the prompts "somewhat useful" or "useful," students responded along a continuum, with the most common response "somewhat useful." Mentor responses were bimodal, with a majority finding the prompts useful, a strong minority finding them not useful, and only a small number "somewhat useful." Some of the comments from mentors who found email prompts useful:

"I really appreciate the E-mails with ideas of topics I can bring up with my protégé. I use the ideas to initiate E-mails. Keep up the E-mails."

"Kind of mentoring me at the same time!"

"Much appreciated as reminders."

"They have been good reminders, if for no other reason but to remind me to drop a note if I hadn't heard from my protégé for awhile."

"They have been very helpful. Sometimes it is hard to think of things to write about if everything is going well. Sometimes the protégé's don't have any questions because they are concentrating on school work and don't have any pressing problems."

"Very!! The topics of discussion are great!"

"Yes, I think it's a great idea. My only concern is that the "suggestions" have been taken as "assignments" by my protégé, so if she doesn't get to something she feels guilty..."

"Yes, these are good. A regular monthly schedule would be good (like the 1st or 15th of the month) - maybe you are hitting me once a month, I haven't been tracking."

"Yes. Even if we don't talk about the prompt the same week it is received, it's nice to have a list of topics handy when I'm at a loss for words!"

Others indicated the prompts eventually became unnecessary.

> *"In the beginning, yes. Since then, our e-relationship has taken on a life of its own."*

> *"Somewhat. We were underway and onto other things by the time most of them came through. But it's nice to know we were on the right track."*

> *"Somewhat. Most helpful was the advice that you need to talk about the small stuff--outside activities, life in general--before you will be prepared to talk about the big stuff. You can't just jump into a mentor relationship without getting to know each other."*

We believe that it would be useful to explore strategies for "fading away" active prompting, especially for experienced mentors and/or mentors who indicate they are unnecessary. The following (mentor) respondent's suggestion may be worth trying: shift more of the topic-setting responsibility to the protégé, who is after all the principal beneficiary of the relationship:

> *"My protégé has asked me questions from them. Honestly, I'd rather you e-mail the stuff to them and let them ask us stuff they want to. I'd like to cut down the number of e-mails I get from the MentorNet program."*

Some of the respondents who didn't find the prompts useful attributed this to the (unprompted) success of their relationship, and some even encouraged their continuance, although they weren't personally helpful:

> *"My protégé and I have had very little difficulty finding things to talk about. She is very open with questions and often comes to me with concerns and frustrations about things she is facing. Therefore, we haven't needed the prompts."*

> *"Not for us, but I still think it's a good idea."*

> *"Not really, but I wouldn't stop them."*

Mentors offered a few other isolated insights:

> *"Actually, I think that it makes the contacts too formal and inhibits you from really learning about the other person."*

> *"My protégé didn't like any of the topics discussed and picked her own."*

> *"Perhaps the prompts should be a smaller list and more focused."*

Student responses sounded similar themes:

> *"More email prompts please! One a week would be nice! They are very helpful but are much too few and far between."*

> *"The e-mail prompts are wonderful and I wish we receive more of them. They help you get the conversation going."*

> *"Yes, at times we think there's nothing further to discuss but the MentorNet e-mail may prompt another discussion."*

One insightful student response tempers the recommendation we made above:

> *I think it would be advantageous if the mentor were also prompted to ask questions and get discussions going. I feel as if each week I come up with a question and my mentor answers it - it's very one-way like that.*

For 1999-2000 we suggest collecting some data on the possible development of an adaptive prompting system: one that solicits feedback on the progress of mentoring and can issue prompts to mentors and/or protégés in response. Such a system might help balance some participants' needs/desires for prompts with other participants' preference to restrict most mentoring-related email to interactions with their mentoring partner. An experiment to evaluate the feasibility of such a system is outlined in Appendix D.

Mentor Gender

We found few differences between male and female mentors with respect to outcomes. Male and female mentors and their protégés reported comparable levels of email traffic, similar satisfaction with the overall quality of their matches, and similar ratings of most other outcomes. There were differences on three discussion-topic issues: (1) only half as many male mentors reported discussing their future career plans as did female mentors (protégés did not report this difference); (2) female mentors were twice as likely to discuss the treatment of women at their company (reported by both mentors and protégés); and (3) students with female mentors were much more likely to report that they discussed "balancing career and life," compared to students with male mentors (mentors did not report this difference). However, for a wide range of conversational topics and other outcomes, there were no differences observed between male and female mentors.[8]

Overall this is a noteworthy finding because MentorNet's rate of growth could probably not be sustained if success required matching students with female scientists and engineers—whose limited numbers are, after all, the motivation behind the program.

Topics like those noted in (2) and (3) above are nevertheless important for some students, and it is worth supporting mechanisms for participants—protégés and mentors alike—to explore topics like "balancing career and life." A more public forum like the electronic discussion groups (accessible to MentorNet participants, but not to the general public) might be a good place to explore these issues, although it would be necessary either to moderate the discussion groups or to provide a technical method for participants to post anonymously. (There is a world of difference between talking one-on-one with a mentoring partner about an issue and posting it for all the world to see. One can easily imagine legitimate stakeholder concerns with having sensitive issues discussed in a public forum, by individuals whose email addresses clearly indicated their employer or university.[9])

Participant Ethnicity

The following table compares race/ethnicity of protégés and mentors. Minority protégés are much more numerous that minority mentors, reflecting underlying age-related workforce demographics. Analysis of outcomes revealed no significant differences by ethnicity for a range of student outcome measures.

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[8] It should be noted that student applicants had the option of requesting that they be matched with a mentor of a specific gender, and that when a preference was expressed, it was accommodated.

[9] An anonymous "listserv"-style discussion group can be set up relatively easy using MS Access on an NT server. See, for example, our student peer-review system at http://ei2.education.cornell.edu/EI/Bioassays/ PeerReview/ default.htm.

Outcomes examined included general, informational, and psychosocial outcomes, as well as student satisfaction with the quality of mentor-protégé matches. Mediated by technology, mentors and protégés may feel that their ethnicity, or issues related to race or ethnicity, are not relevant or productive topics for discussion. We saw no references to racial or ethnic issues in any of the email message traffic, and although gender was—not surprisingly—a commonly reported theme in open-ended responses to questions on the questionnaires, race and ethnicity were never mentioned.

This finding lends support to the program's decision to generally disregard ethnicity in matching students and mentors. This should facilitate the matching of growing numbers of minorities in scientific and engineering majors.

Race/ethnicity	Respondent (%)	
	Protégé	Mentor
African-American	8.2	3.3
Asian-American	27.4	8.2
Hispanic/Latina	3.3	3.5
White	43.9	74.8
Other	3.5	3.5
Not Specified	10.1	4.5
N	515	515
Total	100.0%	100.0%

Mentors' Educational Backgrounds

Mentors' (highest) educational backgrounds are summarized below.

Mentor's Highest Educational Level	Frequency	Percent
Associate's	5	1.0
Bachelor's	198	38.4
Master's	178	34.6
MBA	23	4.5
M.D.	2	.4
Ph. D.	101	19.6
Other/not specified	8	1.6
Total	**515**	**100.0**

We found no differences in mentoring success related to mentor educational background. However, the program's matching process guarantees that mentors always have educational degrees equal to or higher than their student's degree program. This year, 82% of student participants were in bachelor's programs, 8% were in master's programs, and 10% were in doctoral programs.

We also found no evidence of differences in mentoring outcomes related to the degree being pursued by students (see the analysis of variance in Table 21 of the accompanying SPSS output file).

Sectors

In their applications to MentorNet, participants were asked to identify the industrial sector(s) in which they work (mentors) or intend to work (protégés). As the following table shows, the program appears to be successfully recruiting mentors to match the diverse sectors of student interest. It appears that the pools of actively participating mentors and students cover broad and similar cross sections of industrial

engineering and science.[10] (Note: for ease of interpretation, sectors are identified below for mentors' and protégés' first choices only; many participants provided multiple descriptors.)

Category	Mentor Career Description	Protégé Career Interest
Aerospace	5.4%	4.5%
Banking	.6	1.9
Biotechnology	4.1	7.0
Chemicals	3.7	3.1
Computers/Hardware	4.3	6.6
Computers/Software	25.8	17.3
Consulting	8.2	13.4
Entertainment	.2	1.6
Entrepreneurship	.6	1.4
Health care	.8	3.1
Manufacturing	8.5	4.3
Petroleum	2.3	.8
Pharmaceuticals	2.3	4.1
Research	15.0	18.1
Semiconductors	7.4	2.5
Telecommunications	4.1	5.2
Transportation	1.2	1.6
Utilities	2.1	.4
OTHER	3.5	2.7
Total	**100%**	**100%**

Colleges Attended by Students

The program is making good progress in expanding its base to new colleges and universities. Last year (1997-98), protégés participated from 15 colleges and universities, four of which (Cornell, Stanford, the University of California at Berkeley, and the University of Virginia) accounted for 70% of student participants. This year, students participated from twice as many schools, and the top ten schools are needed to account for 70% of participants. Almost 50% of 1998-99 participants came from schools that were new to MentorNet this year.

Matching Substudy

The process of matching mentors and protégés is a technically and sociologically challenging aspect of the MentorNet process, and the staff continues to experiment with and modify both the computer tools and the human review process used to choose the best mentor for each student. Matching involves the extraction of data from mentor and student applications and an iterative computational process of identifying potential mentors, student by student. The MentorNet staff then reviews each preliminary computer-identified "best match" and sometimes rejects the initial (algorithmic) recommendations. In its internal documentation of this process, the staff wrote:

[10] It should be kept in mind that our analysis focused on mentors and protégés who were actually matched, and the MentorNet program's matching algorithm strongly favors close matches on field of study. Surpluses of mentors in under-enrolled university fields would not show up in this table, if they were not matched. However, if the program relied on those surpluses to advise students "out of field," differences would probably show up.

> *When matches are deemed inadequate, it is most often due to information either the student or the mentor entered into the "Comment" fields, which could not have been considered by the ... matching program. (1998-99 Matching Protocol for MentorNet, p. 2)*

When computer suggestions are rejected, matching is done by hand, a process that involves artistry as well as science. To date, we have not studied the matching process as it takes place; this might be a useful topic for subsequent evaluation. Although the matching tools are being continually improved and the staff is gaining valuable experience, the program faces important challenges as it grows from an educational project comparable in enrollment to a small high school to one enrolling as many participants as a good-sized university.

We conducted a detailed substudy of the matching process using regression models. The findings are summarized below, and some additional details are included in technical note 3, Appendix A. Annotated output of the regression models is provided in a separate, annotated SPSS Viewer file (Mnet_9899_tables.spo).

For machine-recommended pair matches, measures of "closeness-of-fit" were tallied and saved by MentorNet staff. These measures (one for the mentor, one for the student, and one combined) are percentages reflecting how many matching criteria were satisfied.[11] Of the 515 pairs of mentors and protégés in the 1998-99 cohort, 60 pairs were matched by hand. Because these pairs were not machine-matched, closeness-of-match statistics were not calculated and saved with the other participant data, and consequently we did not use them in all of the regression models.[12] To increase statistical power, we ran most models twice: once with the hand-matched pairs omitted (so closeness-of-fit data could be entered as predictors) and once with the entire population (omitting those predictors).

Regression models showed little evidence that variation in protégé outcomes could be attributed to matching variables. In other words, within the population of matched pairs, the effects of matching preferred career choice and preferred field on outcomes (both constructed outcomes and participants' ratings of the year-end "quality of the match") were negligible, as was other undifferentiated "closeness-of-match" variation, which could be estimated (roughly) by entering MentorNet-provided overall "percentage matched" figures into regression models along with career-match and field-match data.

The situation was a little different for mentor outcomes, where matching preferred careers yielded significantly higher mentor summative ratings of the overall quality of the match.

In reviewing these findings, it is important to keep in mind that there is clearly a "floor effect" in the study: only reasonably good matches were approved. Furthermore, the nature of the matching algorithm and the manual-screening step of matching almost certainly introduced a significant amount of "noise" into the data that we could not easily eliminate statistically. For example, a pair that was "mismatched" on career choice would probably be approved if and only if it was well matched on other grounds. Consequently, the predictors interact by design. Of course, we looked only at the hypothesized most likely candidates for match-related outcomes variation: field choice, career choice, student degree level,

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[11] In addition to universal matching criteria, applied to all matches (e.g., participants' preferred industrial sector), 1998-99 applicants could express optional preferences for some other criteria, such as geographic region, gender, hobbies, alma mater, or sexual orientation.

[12] MentorNet staff offered to run additional analyses to generate closeness-of-fit measures for the 60 hand-matched pairs. Our advice was that the staff time necessary to do this at a busy time of year was probably not a good use of resources. For 1999-2000, closeness-of-fit measures will be saved for hand-matched pairs, and these questions can be revisited next year.

and "other" (undifferentiated contributions to MentorNet's overall closeness-of-match measure). Further scrutiny of the matching process might yield other predictors.

The Content of Mentoring

On both the midyear and final questionnaires, participants were asked about the content of their email exchanges, using both topic checklists and free-response (essay) questions. Responses to the checklist-formatted queries showed that more than three-quarters of participants discussed their backgrounds, the mentor's job, college life, and the protégé's career plans. Also listed by most questionnaire respondents: social interactions/jokes, the industry workplace, balancing career & life, managing time and/or stress, and job hunting and/or interviewing. Less frequently cited were differences between academia & industry, e-mentoring logistics, participants' reasons for participating, women's experiences at the mentor's company, and mentors' plans.

The following table lists the topics, sorted by the frequencies they were cited by protégés. There are some interesting differences in the protégés' and mentors' reports: protégés were more likely to report social interactions/jokes, balancing career & life, time & stress management, and women's experiences at the mentor's company. Mentors were more likely to report discussing the protégé's plans and job hunting/interviewing. A frequency list like this tells us only what was discussed at some point, but it does not indicate how often topics were revisited nor does it tell us what topics participants found most useful. We addressed those issues through content analysis of the free-response questions and actual email exchanges between participants.

Topics discussed (from checklist	Protégé (%)	Mentor (%)
Your backgrounds	95%	97%
The mentor's job	88	80
College life	82	80
The protege's plans	78	84
Social interactions, jokes	73	63
Industry workplace	68	65
Balancing career, family, life	66	57
Managing time, stress	65	51
Job hunting, interviewing	55	60
Differences between academia & industry	50	45
E-mentoring logistics	48	41
Your reasons for participating in MentorNet	45	43
Women's experiences at mentor's company	45	35
The mentor's plans	37	22
Valid N (listwise)	262	348

Thematic Analysis of Open-Ended Questions and Email Exchanges

In the final questionnaire, students and mentors were asked the following open-ended questions:

1. What were the most useful topics you discussed with your mentor?
2. What was the most valuable aspect of your email mentoring?

3. Please describe, in as much detail as possible, any specific positive outcomes of your mentoring experience.

1188 essay-type responses were received, read, and coded using up to 3 codes per question. Coding was done using constant comparative analysis and the same codebook as the email monitoring exchanges. Questions were coded using a Microsoft Access form directly into our database, so that the responses to all three free-response questions could be seen at the same time (to provide some context). One of us (C. Berger) did the preliminary coding for all of the questionnaires, and a second researcher (C. Cunningham) did a second reading and recoded a small number of responses (approximately 10-15).

In the following discussion, we include insights from both the questionnaires and actual emails received through the email-monitoring study.

> Note: Quotes in this section are attributed using annotations: Questionnaire quotes are followed by curly brackets { } containing a multi-character code. An initial letter u, v, o (used, value, outcome) indicates which of the three open-ended questions generated the response. This is followed by a letter F, S, J, R, L, G (freshman, sophomore, junior, senior, 5th year student, graduate student), and ends with the student identification number. Email quotes are not attributed to individuals, and begin with either "Mentor:" or "Protégé:"

Content Themes

Impartiality. One key feature of ementoring was that it provided protégés with an opportunity to ask questions of an impartial person. This appears to be a central way that mentoring is used. Although students solicit advice from their parents, professors, and peers, their relationships with their mentors fill another niche. Mentors provide a real-life perspective based on their experiences in the field of engineering. And although mentors have biases of their own (which they often articulate), structurally they have much less of a stake in the decisions that students make—such as which internship or job to accept or whether or not to change their major. Many of the mentoring relationships develop an atmosphere in which the mentor is a confidante who is "safe" to bounce ideas off or to whom one can air insecurities or other concerns.

Students commented:

> *"It was refreshing to have a candid relationship with someone in the industry who was not seeking to hire me- someone who was not judging me. It was cool to have a mentor to offer useful advice concerning time management, family life, and other important issues that will affect me post-undergraduate." {oR205}*

> *"I thought the best part was having an objective person to bounce ideas off of. Someone to discuss job interviewing strategy, offers, and career decisions." {oL531}*

> *"The most valuable aspect was being paired up with a complete stranger and getting to know their life, as well as them getting to know you. It was valuable to me to be able to go to a neutral person on work place, scholastic, and personal matters." {vS709}*

> *"I had someone to write to when I was stressed who was not going to judge me by what I said or how I felt." {vR26}*

Personal relationship & encouragement. Although students report that mentors provide an external, impartial viewpoint, they simultaneously value the support and encouragement that mentors offered.

Personal interactions associated with mentoring surface in student reports as one of the most valuable aspects of mentoring. Conversations about personal issues were most frequently cited as a valuable aspect of ementoring by freshmen, sophomores, seniors, and 5th-year students (32, 28, 44, and 36%, respectively). Many fewer juniors (9%) and graduate students (17%) mention this. A related topic that is commonly cited by students in every class cohort as valuable is mentors' sharing their knowledge and experience. At least 20% of the students in each cohort identify this variable, with almost double the number of juniors citing its value (38%).

Not surprisingly, the positive outcomes identified by women in different stages of their college career differ. Freshmen are most likely to report "encouragement they received from their mentors" as a positive outcome (11%). 4% of sophomores also expressed this sentiment, tailing off to 0% by junior and senior year. This outcome reappeared (at freshman levels) for 5th-year and graduate students (Code 2632). Senior women appear to view their ementoring relationships as the starting point of professional networking: 25% reported that having their mentor as a future contact was a positive outcome, a rate five times higher than that reported by students overall (Code 2716).

> *"I had a feel of belonging to someone. [My school name] is a big school and nobody cares about individuals. I was just glad to have someone who listened to me and wanted to know about how I was doing in school and everyday life." {oR26}*
>
> *"My mentor was very supportive of all my accomplishments. I always felt like there was somebody cheering for me." {oL416}*
>
> *"I feel more confident to do what I like to do in terms of future jobs. She also gave valuable advice that I have printed out and can go back and read when I need it. I feel like I have an "ally" now in science that I can count on support from." {oG73}*
>
> *"I finally found someone who I can talk to about the field that I am very interested in. And she was the only person that gave me a lot of encouragement in my decisions. And she made me know that I was not alone in going through all the difficulties." {vR448}*
>
> *"This reaffirmed my belief that I want to be an engineer. It helped me to decide that working in industry would be good, and when I was feeling bad because of school or whatever she gave me encouragement." {oF370}*
>
> *Protégé: "I think this program is very helpful. You have been great in providing information for me and also giving me someone to look up to. I tell all my friends that my mentor has the life I want to live when I grow up."*

One formula for robust interactions between a pair is when academic and personal information are interspersed in an email. Updating a partner about both the happenings in school/work life as well as personal life seems to produce a "closer" relationship between mentor and protégé. Students are genuinely interested in the lives of their mentors—both inside and outside of work. Mentors appreciate the opportunity to be reminded of the concerns and perspectives of college students.

School matters and coursework. Students earlier in their college career are most likely to find discussions of "school matters" useful (decreasing from 40% of freshmen to 21% of seniors). This suggests that freshmen and sophomores may actually be getting some indirect academic advising from their mentors,

an unexpected possibility, especially when one considers how prescriptive the freshman and sophomore years typically are in science and engineering majors.[13]

"She was very helpful in keeping helping me with difficult classes, such as chemistry. She encouraged me and reminded me that it was an introductory course that was meant to weed out the people who aren't serious about science majors. Her positive comments and the way she related my situation to her college experience helped me to succeed in that class." {oF244}

"I was having some trouble picking some classes for next semester, but my mentor was more helpful than my guidance counselor." {uF480}

"I am strongly considering changing my major and my mentor helped me to analyze this decision. She was very supportive". {oF135}

"I really appreciate the advice she gave me regarding choosing a major and applications of a major in a career. I enjoyed hearing about her experiences." {uF74}

"I understand that choosing my major was not the biggest deal that I thought it would be. I realize that I can change majors and careers, and probably will change my career from what my major is at this point. Our correspondence really helped to alleviate the pressure of choosing a major." {oF74}

"About changing major.. and she gave me a lot of advice and showed me a lot of options other than changing my major." {uR448}

Email monitoring provides some examples of some of this indirect academic advising:

Mentor: "I am not exactly sure what Hydrogeology covers, but I had to take a Hydrology class and a Geology class and I found both to be quite interesting and not too difficult. I'm sure you'll do fine in contaminant hydrogeology. One thing you may want to do is borrow a textbook from last term (from one of the students in the class) and just flip through it to familiarize yourself with the terminology. "

Protégé: "Any advice about the classes? What part of ChE did you like the most? ...and how on earth did you figure out what you wanted to do in the field of ChE? I'm beginning to wonder what kind of job I'm going to look for and I really have no clue what I want to do."

Mentor: "Sorry to hear about your grades - you're right, they suck. I can say that because I played "catch-up" a good part of my college career trying to recover GPA points because I started out on the low end. Sounds like a good recovery plan though. YOU can do it - just got to work the plan. Just one other thing to think about - I don't know if they offer a non-credit class about study skills but check into it. I did well in high school - didn't have to study much to get B's and so I thought college would be the same. After I nearly flunked out my first year in engineering school, I took a study skills class - what a difference - I ace'd nearly every class after that."

Mentor: "As you progress through your IE curriculum, think about the safety of plants. Such as safety glasses, ear plugs, hard hat, face masks or air breathing equipment and how this will reduce

[13] Elsewhere on the questionnaire, whether students discussed college with their mentor was one of only two topics that was significantly different between years of college ($p<.01$).

the effectiveness of the job but keep the employee from getting injured. We had a serious injury several years ago when an operator at one of the train car unloading stations ignored the safety procedures and put his hand into an operating equipment and almost cut his had off. I remember my time and motion classes did not discuss the safety aspect of the job. Thinking safety is something I have come to regard as the most important part of any job or activity. In addition, federal regulations require follow-up checks to insure that employees do not suffer long term illnesses such as loss of hearing. If you are interested in the industrial environment and the impact on employees, this is an area which has a lot of potential."

Job workplace & skills. Freshmen and sophomores profit from learning about mentors' jobs, their workplace environment, and the skills that they use. Learning more about mentors' jobs and workplace environment is the first or second most frequently mentioned topic by freshmen and sophomores in all three free-response questions (positive outcomes, useful topic, and valuable aspect.) Freshmen (34%) and sophomores (44%) more commonly identify learning about mentors' jobs and workplace environment as a positive outcome, compared to juniors, seniors, 5th-year students, and grad students (5, 12, and 21% respectively, Code 1300). Freshmen, sophomores, and seniors also cite as positive outcomes "learning more about the skills used by engineers in the workplace" (34, 39, and 40%); few juniors (5%) mention this topic (Code 1150).[14]

"I found to be most helpful the duties my mentor had at her job. Industrial Engineering is so broad, it was good to hear some specifics. It also helped me to learn which classes my mentor actually USED on the job." {uS532}

"The most useful topics discussed were my mentor's job experiences, how to handle lots of activities at once, the relative importance of course work compared to on the job training, and what difficult situations my mentor has had in her job (especially interacting with other coworkers)." {uR755}

"Perspectives from the industry and work force. She emphasized that grades were not as important as work experience and determination." {uS407}

"I had someone to encourage me through the rough weeks, give me an idea about what I am working so hard for, and to give me new ideas about what I can do now to get ready for the future." {oF415}

Part of this job-related education concerns balancing a career and a family:

"She told me a lot about her personal experiences in the civil engineering field. She told me what she wished she would have done differently and we discussed how her family and career mixed." {oF733}

"I learned about balancing an engineering career, while being a female (a mother and a wife), which is very important to me!"{oF268}

and some of it concerns mentors' perspectives on women in the science and engineering workplace:

"Since there are few women in my field, I felt less isolated and could put my experience in more perspective by hearing the thoughts and about the experience of another woman." {oG75}

[14] Elsewhere in the questionnaire, whether or not students' discussed the industry workplace environment was one of the two topics that differed significantly by year of college ($p<.05$).

"(I) feel better about becoming a female engineer, as it is a male oriented environment. (I) am more certain that the path I am choosing to succeed later in life and career is correct." {oF897}

A feature of productive ementoring relationships is summarized by a question asked by a mentor of her protégé in an email exchange: "What is your topic of greatest concern?" Much of the conversation between pairs focuses on the stresses that students face. This is especially evident as students take difficult college courses, look for internships, interview for jobs, or choose which job they will accept. The interactions between the mentors and the protégés springboard from these concerns. Students ask for advice or guidance as they work through these events, and mentors offer unsolicited advice based on their experiences. When the mentor shares issues or projects of their own, concern and support can be returned by the protégé.

Skills-related exchanges from email monitoring:

Mentor: "So, I would not be overly concerned about your initial shyness. The best thing to do is build a reputation as a reasonable and non-emotional person, and once you have the reputation and credibility people will listen to what you have to say. Also, (and this will probably be incredibly sexist), in my opinion women communicate much better than men."

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*Mentor: "One thing that comes up repeatedly, with recent grads that we've hired, is that the work environment is *really* different from what they expected...their skills are not as good as they thought, the languages they know may not be enough, the expectations are high for learning on your own, "business" decisions may be more important than technical ones...and other things that can be discouraging."*

Mentor: "Lots of design teams have problems with their partners. Unfortunately, it also happens that way in the workplace also. You don't always get to choose your working partners, you learn to work with them or around them. The best thing you can do is learn what they are good at and then put them to that task. It is difficult to do with an egotistical person, but tact is another important skill."

Mentor: "I think that companies do try to hire women for their point of view. I have found that women add an important aspect to engineering. We have a different way of looking at things from the way that a man may look at a problem. Not to mention women in general are more organized than men and are better at project management - not that that was a sexist statement in any way - just from my experience."

Mentors' expertise is utilized by students when they ask advice. However, another important element of "model" mentoring interactions is that sometimes mentors offer unsolicited advice. Some of the most effective insights (highly appreciated by the students) are perspectives introduced by mentors based on their experiences. Some examples: hints about how to give a powerful class presentation, attributes to emphasize in a resume, and the need to take initiative in informing the project leader of your progress during an internship.

Mentor: "Congratulations on the job well done! I'm sure you all feel great. I would suggest a couple of things for your next presentation. If you need (and know how to do that), try animating some of the PowerPoint slides. It is a relatively simple thing to do, yet it looks very effective. Second, do not overload the slides (5 - 6 lines per slide maximum), and make sure you have an introductory slide, where you explain what you will be talking about, followed by your talk, and a final slide that

repeats the most important points. Also, make sure you practice - give a talk two or three times to the group. You will find out that practicing out loud helps organize your thoughts and streamline the process. Don't forget one thing - if you do not want to be interrupted during your presentation (which may be a good idea if it is a short presentation) - ask your audience to hold their questions until the presentation is over. (If you have more than 10 - 15 slides this is not easy, though.) Sometimes, questions can take you in a completely different direction and you end up not having enough time for the main presentation."

Mentor: "I'm glad to hear you have a good supervisor. Make sure you do ask questions like he/she recommended. The more questions you ask, the more you'll learn. Also, don't forget to find out what other people do within your facility. I don't know if there are other plants around, but try to take some plant tours while you are there. We always encourage our co-ops at [my company] to go on plant trips to each other's plants so they can learn more about what [my company] does and what the other plants are like. One other thing I always tell my co-ops here: make sure you always communicate with your supervisor on the progress you are making. It may be different at [your internship company], but here at [my company], everyone is overworked and time is a precious commodity. So, it is sometimes easy for co-ops to go weeks without talking to their supervisors. I recommend to them sending a weekly (or bi-monthly) update on what they've been doing and how they are progressing towards their project goals. This helps both the supervisor keep track of what you are doing and it helps you keep up with what you have worked on (which helps when you need to update your resume or write up a summary report for school). "

Job hunting, future plans, and careers. Many students correspond with their mentors about job hunting, future plans, and careers. Not surprisingly, juniors and seniors are more likely to identify these themes as useful topics, valuable aspects, or positive outcomes of their mentoring experience. As students progress through college, more and more of them identify "future plans and careers" as useful topics of discussion, increasing from 28% for freshmen, to 42% for seniors and 5th-year students, and 50% for graduate students (Code 1500). Juniors and seniors also find job hunting and student jobs (including summer jobs) a more useful topic for mentoring discussion (50 and 58%, respectively) than do 5th-year undergraduates (42%), grad students (23%) and freshmen and sophomores (32% and 27%, respectively, Code 1530). Juniors in particular benefit from the job counseling and advice they receive: juniors are twice as likely as other students to mention as positive outcomes "interactions with mentors about future plans and careers" (42%) and "job hunting" (42%, Code 1500) and are also twice as likely to report that interactions about future plans and careers are valuable aspects of their communication (21%).

Many students are curious about what the real world of engineering in industry entails and appreciate the chance to learn more about life after school from their mentors. A better understanding of what to expect in the workplace seems to both encourage students and increase their confidence.

"I have a much better sense of what life is like after school for an engineer! (This is something neither of my parents could provide since they're not involved in this field)." {oF335}

"I felt very confused and unsure at the beginning of the program. Because I've had somebody to tell me what it's like-- to make it seem more possible, I feel more confident now." {oR181}

"I have a better idea of what I have to do after I graduate to go into the field. Also, I have a better idea of what kind of work is done in that field on a day to day basis." {oS197}

"i know now what to look for in a grad school, and i also understand some differences between industry and academia" {oJ319}

"I am more aware of what to expect from my new job and career path. I know I am not alone..." {oG503}

"I learn more about the workplace outside school from my ementor. I also learned what people expect from you in real workplace". {oG833}

"Just being able to talk to someone out there in the real work who can give me honest answers" {vR25}

"Getting the perspective of someone in industry. Gaining the sense that it is possible to achieve certain goals especially when you are able to see a living example." {vF35}

Interactions with their mentors also provide protégés with valuable advice about getting and choosing a job. In their questionnaires, students cite the interviewing tips that mentors offered as a useful feature of their exchanges.

"Some tips that I received for interviewing helped me get a really good internship offer" {oJ819}

"Interviewing techniques and how to choose the right offer." {uG337}

Email messages illustrate that students query their mentors for job-related advice and that mentors offer unsolicited suggestions:

Protégé: "I think after I finish the organic chemistry sequence I'm going to try and find a job working in a lab; that'll probably help me get a better idea. Could you help me find someone with an MD or an MD/PhD that I could talk to? I know it's still awhile away but I feel like it'd be a good idea to talk to someone. Are there a lot of jobs open in biochem now? If you don't work for industry, are the only other options working for government or university institutions?"

Protégé: "I was wondering what potential employers are looking for in terms of work experience. Is it good to have one job/internship, like the one I have now, for a long period of time or would I be better off trying different jobs to get a wider background?"

Mentor: "If you would like me to, I would be happy to review your resume for you - since I hire people quite often and have seen hundreds of resumes."

Protégé: "I have an interview Friday with another company and am quite nervous. I got an e-mail that said that I would have two behavioral interviews. I have no idea what that is all about. AHHHH! I feel like I am never going to get a job. I went to a job fair in D.C. and I was either over-qualified or they had no idea what my major is. I try to explain it to people, but all they hear is "Engineering" and get the wrong idea. I know that I am qualified to do a lot of things, but I am not sure if others realize that. Maybe I should change my resume a bit. Would you have time to look at it if I e-mailed it to you?"

Mentor: "Am so glad to hear that your efforts to get the word out on your availability this summer seem to be working. What you are doing right now is called "networking." It is kind of like building a spider web of people that you have contacted. The larger the web, the better your chance of meeting someone and "catching" what you want. In this case it is a summer job. But once you

graduate, all of the people in the web you are building right now will still be there and will have known you for 4 years."

Protégé: "I have a problem, but this time I think that it is a pretty good problem to have. I have two offers. I really think that I want one of the jobs, but the other one is offering more money. I know we have discussed money not being a deciding factor, and it really isn't this time. I was just expecting a higher salary than the job that I want is offering. I was just wondering if you have ever had to negotiate for a higher salary and if you had any advice on the matter. I still have one more interview with a third company before I make my final decision, but I am already pretty sure where I want to go. Any thoughts on this one?"

Mentor: "One thing you may remember is that once in manufacturing it is difficult to leave. If you go with a mechanical engineering position, you can switch to different types of positions or to manufacturing. If you start in manufacturing it may be difficult later on, to get a design position. It depends on what your goals are. Have you tried mapping out your "life" plans? "This is what I would like to do in 3 years, 5 years, 10 years, etc." I know it may sound silly, but write them out. It may help give you a clearer perspective."

Once a protégé secures an internship or job, mentors often offer words of wisdom about how to best navigate, or take advantage of the possibilities that are available in the company:

Mentor: "It sounds like you're getting to see a lot in your job. You mention sending the information to the project guys to do the estimates. I've found it interesting to understand the process the project people go through to make the estimates. Sometimes there are programs...sometimes they work through vendors. To get the whole picture, you may want to discuss with the project people what they are doing and how they are doing it. If this is your only visit to this one plant site, be sure to try to see what everyone does."

Mentor: "One thing I can tell you - always go to lunch with the other engineers. It helps to get to know them and for them to get to know you. However, being a woman this can be a little tricky because unfound rumors fly. The best advice I can give on that subject is always make sure it is a 3 person lunch. Sounds medieval, but it works."

The email medium: In general, most interactions between pairs have a conversational tone. Many of the messages are infused with humor. Also noteworthy is the support function of the relationships. Quite a few mentors (and to a lesser degree, protégés) send cheer-up notes, postal mail or cards to mark important events, and notes of encouragement. In general, after trust between the pair has been established, it appears that email messages are a place where women feel safe expressing their opinions, frustrations, triumphs, and emotions.

Mentor: "Just a short email to cheer you up :) :) I assume you are quite busy so I'll keep my fingers crossed that your projects/exams go well!"

Protégé: "First of all, I want to thank you for the card! I loved it! I copied the poem so I could always read it. I liked it a lot. It was very sweet of you to send it to me! It made me smile!"

Although some pairs express an interest in meeting face to face, protégés and mentors appreciate the unique opportunities that email permits for communicating.

"I made a friend and learned more about myself and what I can do with my future. Also e-mail is a very easy and comfortable way to communicate, because you have more time to think about what you want to say." {vF601}

"It was great to have someone to bounce off ideas and plans who actually had a clue and could help revise them. It also felt good to sit down once a week and put down in words all your academic troubles and achievements to tell someone" {vS201}

Protégé: "I have always had trouble responding to e-mail—I just don't find it very easy to express myself in words--talking would be so much easier. but I do like the format--e-mailing makes this so much more informal which I think is great. I am very shy and I know that if this were a face to face kind of thing I would have a much harder time with it."

Self confidence. One program outcome cited by students is the impact of the mentoring process on their self confidence. This is an important finding because low self confidence has been identified as one of the key factors that contributes to women's exodus from engineering and other scientific fields.

"I feel a lot more confident about my abilities, but at the same time, I know that as a freshman, I don't really need to rush into things too much. It was really nice to have someone to ask the most detailed questions immediately, the type that you don't put up your hands to ask during some formal slide-show presentation. I think it was all around very nice, and I would like to continue the program even till I start working. I might even opt for being a mentor, then!" {oF778}

"I gained a great deal from this e-mentoring experience. For one, I learned to think more positively about myself and be more confident in my abilities. I learned that failure will happen, but you have to get up one more time than you get knocked down to succeed. Most importantly I've gained a true role model in my mentor. My mentor is the first female engineer I've met. She's everything I've aspired to be and more." {J1027}

"I have confidence on my way after e-mentoring. I haven't gotten any job experiences except internship. Thus, I was a little bit afraid of being out of school and taking a new environment as a career woman. However, my e-mentor shared his experiences, and showed me how to get over those anxieties. I am not afraid of being a great career woman, anymore." {S184}

"I'm more confident going into geology. I don't feel so bad about how I did freshman year either. It was just nice to know that I'm on right track with my studies and that everyone feels behind their first year." {oS960}

"It made me much more confident about pursuing my goals as an engineer, despite the stereotypes that I must overcome." {oS794}

Mentors' Perspectives

Mentors' identification of useful topics overlap strongly with students'; they found school matters (33%, Code 1200), job hunting and student jobs (31%, Code 1530), job and workplace environment (29%, Code 1300), future plans and career paths (26%, Code 1500), skills needed in the workplace (19%, Code 1150) and personal issues (16%, Code 1100) most productive to discuss. Not unexpectedly, the "positive outcomes" and "most valuable aspects" that mentors express differ from those of students. Mentors' responses seem to indicate that they participate because they are committed to helping young women in engineering and are willing to share their knowledge and experiences. Mentors report being helpful (29%, Code 2710) and gaining insight into student life today (14%, Code 2720) as positive outcomes of their

experience. They find that sharing their knowledge (25%, Code 2661), discussing personal issues (22%, Code 1100), and listening or acting as a sounding board (18%, Code 2633) are also valuable aspects. Most interesting perhaps, is the fact that second most frequently cited positive outcome of the program by mentors is that their mentoring experience helped them to improve their interpersonal skills (24%, Code 2740). Many mentors also used the opportunity to reflect upon their own career trajectories and future plans. For example, mentors commented:

> *"This experience helped me to explore my leadership potential since I was able to guide, listen, help and assist someone not only in the academic and professional aspect but also in the personal aspect."*
>
> *The experience made me "better able to express my thoughts; need to future enhance my thought processes and how to generate a conversation."*
>
> *"The experience made me reflect on decisions I had made in my career and if they were successful. Also, made me place in black and white some of the difficulties I had faced in the workplace as a woman, and how I might have better resolved them."*
>
> *"In answering several of her questions, I had to think deeply about my life and experiences, so that I could formulate good answers. I feel that this was valuable for me."*
>
> *"An opportunity to look back and evaluate my decisions 25 years later. The self assessment has been helpful in making decisions about the future."*
>
> *"It caused me to step back and think about how I could better mentor the younger engineers around me."*

MentorNet Electronic Discussion Groups

During the 1998-99 MentorNet program, participants were given opportunities to join one, or several, of 13 different electronic discussion groups. All students who had applied for, but were not matched in, one-on-one ementoring relationships (434 students), and all the mentors, whether matched in one-on-one relationships or not (630 mentors), were invited to subscribe to these electronic discussion lists. Of the 1,127 professionals and students invited to join the electronic discussion lists, 419 subscribed and remained subscribed at the completion of the life of the electronic discussion lists. These 419 subscribers represented 37% of all those invited. Of the total subscribers, 33% posted to a list. Professionals accounted for 73% of those who posted (27% were students).

The "topics" for the electronic discussion groups were generated in three ways, first by considering known topics of interest for women engineering and science students, such as "Balancing Work and Family," "Women's Concerns," and "Job Searching." Second, staff created lists after considering the educational level of the students involved in the program, such as Frosh/Sophomore and Ph.D. Level Students. Finally, lists were created based on the fields of the students and the professionals, such as Computer Engineering, or Math/Physics.

Thirteen unmoderated lists were available. These included thematic, year-based, and field-based options: Work/Personal Balance, Job Search, Women's Issues, Engineering, Computer engineering, Frosh/Sophomore, Junior/Senior, Masters Level, Ph.D. Level, Bioscience/Engineering, Math/Physics, Environ/Geological, Chemistry. 8 of the 13 lists fizzled out within 14 days. The topic-based electronic

discussion lists were much more successful than the lists that grouped individuals by educational level or by field of interest.

A content analysis was conducted on the remaining five lists to identify factors that influenced these lists to continue beyond the initial introductory period. Usually, one of the list members posted a question or introduced a topic that helped motivate additional discussion. Sometimes students generated the questions; in most cases, however, the mentors fueled the discussion and helped keep active the electronic discussion lists

One of the most effective discussion prompts was the personal experiences thread. Initially, this was mostly the women professionals and students offering a summary of their experiences. Specific examples, events, or insights, seemed to stimulate and maintain the interactive exchanges. For example, one posting read:

> *"I am working my way into upper management, and have no role models. I had to find a new hairdresser to tell me what professional women with curly hair do! Also, as a field engineer, I wore jeans and a nice shirt most of the time. As a manager, I have to dress up, but don't know how!! Well, I'm doing better now, but it is hard not having someone to emulate."*

This comment was later revisited and a discussion of clothing for working women engineers and managers ensued. Another comment spurred a heated debate:

> *"But now, discrimination is more subtle and more individual. An older colleague will occasionally "put me in my place" with an act of courtesy - offering me, but not the men around me, a seat or assistance with a heavy box."*

Not surprisingly, another type of item that seeded conversations was questions. Some of the questions sought information, some sought advice, and other questions were more philosophical. For example, one student asked:

> *"So, I wanted your opinion of Monica Lewinski. Our professor applauded her for being a feminist and changing the face of feminism. However, a few of us in the discussion decided that we couldn't respect her because the decisions she made were very poor. Our professor insisted that the issue today, is that society is pitting women against each other by condemning Monica."*

This question prompted a lengthy exchange about who was to bear the brunt of the blame and various issues related to personal views on marriage, power, and maturity.

Finally, some of the most successful conversation threads were those that included (or evolved into) controversial issues that invited a variety of perspectives. Some of these were related to national events or policies. A commonality of these conversation threads was that they were *not* necessarily based in personal experience, rather, they stemmed from philosophical views, opinions, or personal interpretations. The discussion continued most robustly when the discussion prompted diverging opinions or perspectives.

FUTURE DIRECTIONS FOR MENTORNET AND ITS EVALUATION

As the MentorNet program matures, it faces challenges related to growth and sustainability. A critically important resource for continued program success will be the pool of good mentors. Recruiting, supporting, and retaining top-notch mentors over multiple-year periods obviously must be high priorities

for the program. A second set of challenges concerns selection of and followup with protégés: ensuring that student participants are committed to the work of sustaining a mentoring relationship and that help is provided at critical points to diagnose and remediate mentoring-related problems.

These challenges are related in important ways. Limiting the program to students who are serious about mentoring increases the likelihood that mentors will find their own participation intrinsically rewarding and will become better mentors over time. By the same token, protégés who work with excellent mentors may be more likely to become engineers, to work in industry, and to eventually as mentors themselves.

Recruiting. To date, IEG's evaluation has not focused at all on recruiting-related issues, beyond occasional discussions with MentorNet staff. The MentorNet program has met its annual targets for recruitment of both students and mentors and appears to be on track for the coming year. Nevertheless, there are a number of recruitment-related questions that are worth exploring systematically, in part through interviews with campus and industry stakeholders, scheduled for 1999-2000. These include

1. What are the most effective ways for MentorNet campus representatives to participate in the recruitment of students?
2. What roles can campus reps play in the recruitment of alumni who are now working in industry?
3. How can MentorNet industry reps facilitate the identification and recruitment of good prospective mentors?
4. What are the recruiting and participation priorities of the various stakeholders and how can they be addressed when they differ and even conflict with each other?
5. How can applicants be screened to ensure that the highest possible number of matched participants are serious about and prepared for the mentoring process?

Matching. Although the MentorNet staff uses sophisticated computer tools to assist in matching student applicants with mentors, the process remains complex and labor-intensive, in part because each match is hand-checked and in part because we still do not know what factors best predict successful mentoring relationships. Analysis of match-related components of mentoring success in 1998-99 by IEG shed little light on what makes a successful mentoring experience. Nevertheless, MentorNet staff and the external evaluators are in agreement that good matching matters; more fine-grained analysis with the 1999-2000 data may help elucidate which components of matching make the most difference in successful mentoring.

In 1998-99, analysis of the effects of matching on student outcomes was limited to closeness of actual and preferred industrial sector, closeness of actual and preferred career area, and an additional pooled component that was calculated at the time of matching. This pooled component was largely comprised of data on the degree of match for criteria identified by either the protégé or the mentor as a matching preference, not the degree of match for any criteria. For 1999-2000, we plan to run regression models that include both participant match priorities and non-priority match similarity. In that way, we will be able to gauge the importance of a wider range of match-related factors across the entire population of participants. Coupled with a larger sample size in the larger 1999-2000 participant population, this should increase statistical power and permit us to discriminate better between important matching criteria and less important criteria.

Support and problem-solving. Appendix D outlines a proposed mechanism for developing and evaluating an adaptive prompting system, which would solicit feedback from participants and tailor the amount of active MentorNet prompting to their needs. We believe that a system like this is advisable to avoid

annoying participants (particularly second or third-time mentors) with unwanted emails. However, the system would also provide a means of diagnosing problems during the mentoring process.

We recommend prompting and soliciting feedback from protégés more frequently than from mentors, and generally erring on the side of under-communicating with mentors except when a problem has been identified. Nevertheless, both protégés and mentors need to be confident that mentoring-related problems that arise will be responded to promptly. We plan to work with MentorNet staff during 1999-2000 to document the existing ongoing support system and to explore options for future support. Some initial questions:

1. How do participants alert MentorNet of mentoring-related problems?
2. How easy is it for participants to find support online, and to find the answers to their specific questions or concerns?
3. How important is it to identify under-functioning partnerships and to remediate or terminate them formally?
4. How do the needs of first-time mentors differ from those of veteran mentors?

Formal evaluation. We recommend restricting evaluative questionnaires by us (Ithaca Evaluation Group) to a single year-end questionnaire, in order to reduce the reactivity of the evaluation and to avoid annoying participants, especially veteran mentors. Participants complete lengthy questionnaires each time they apply to the program (some mentors have done this three times), and twice-yearly questionnaires of all respondents are both statistically unnecessary and potentially aggravating, especially when the respondent has an unreliable internet connection, is working across a corporate firewall, or is dealing with other technology related stress. Our evaluation plan for 1999-2000 includes an exit questionnaire of all students and a sample of mentors. We propose to thank all mentors for their participation and to invite them all to provide feedback, but to make completion of the questionnaire optional (with no reminder messages) for most mentors. A statistical sample of mentors will be identified for aggressive followup, in order to achieve a high response rate.

APPENDIX A: TECHNICAL NOTES

Some technical notes on evaluation methodology are collected here. They are referred to by number in the body of the report.

1. Solicitation of questionnaires. The process for administering questionnaires is described below:

   a) Prior to both the midyear and year-end questionnaires, MentorNet's mentoring specialist, Dr. Peg Boyle Single, alerted mentors and protégés in one of her regular communications that we (Ithaca Evaluation Group) would be contacting them.

   b) We sent each participant an individualized email requesting completion of the appropriate questionnaire. These emails addressed the recipient by first name, outlined the purpose of the questionnaire, described how to contact us to decline to participate, and alerted the recipient that we would remind them later if they neither declined nor completed the questionnaire. A sample letter is included in Appendix C. Each message included a hypertext link to the questionnaire. Clicking the link would launch the user's browser, connect to our web site, and display the questionnaire, with a Submit button at the bottom.

   c) Submitted questionnaires were handled by a Perl forms-processing script and then automatically emailed to us by our internet service provider. Periodically, we downloaded these emails and did post-processing. Post-processing, which was a very time-consuming and complicated process, is described in technical note 2. However, the post-processing step had to be executed before reminders could be sent, to avoid "reminding" people who had completed the questionnaire.

   d) When the return rate of questionnaires dropped off (approximately 3 working days after an invitation was emailed) and we had post-processed all returns to the point where they were merged into our Access database (this took a minimum of 2 more days), we went through all non-questionnaire emails by hand to flag the records of any respondents who had notified us that they did not wish to complete this phase of evaluation.[15] Reminders were sent to participants who had not completed the questionnaire, had declined to participate, or had requested a paper questionnaire (we had a handful of the latter, and sent them via conventional mail).

2. Post-processing of questionnaires submitted electronically. As noted in "Evaluation Goals and Design," midyear and final questionnaires were completed by participants via their web browser, posted to our internet service provider, converted to email messages via a Perl script, and emailed automatically to us. Once we received these questionnaires, we post-processed them via the following steps. First, emails were concatenated to a single text file. A Perl script scanned the file and wrote out a second, tab-delimited text file, with one record per respondent. This new file included a field to identify the type of respondent (student or mentor) and cleaned up a number of problems, such as control characters embedded in open-ended (essay) responses. This file was then imported into Excel, where it was sorted and inspected visually for duplicate records (which would occur if the respondent hit the Submit button more than once). Invalid entries were corrected or deleted (for example, two mentors forwarded their solicitation letters to their protégés, who filled out the incorrect questionnaire). From Excel, data were imported into an Access database, where teacher and student questionnaires were merged into single records, along with data collected by MentorNet during the application process. This step also involved a lot of handwork, because participants' names and email addresses often did not match the database, and 1998-99 respondents had no unique identifiers that they could include in their responses to facilitate matching existing database data with new questionnaire data. Another common problem that had to be

[15] At the mid-year point, some participants indicated that they were not yet ready to provide feedback, so declining at the mid-year point did not exempt participants from receiving the yearend evaluation request.

corrected by hand was the frequent entry of non-numeric data in the fields that queried participants about their frequency of email contact.

Before exporting data to SPSS, qualitative coding of free-response (open-ended) questions was done. Coding was done in Access because it provides a much better environment for viewing responses in context (SPSS displays data in tables, truncates strings to 255 characters, etc.).

The final step in post-processing was to export the Access data to SPSS. In addition to truncating many longer essay responses, SPSS has very restrictive rules for variable naming, and any Access fieldnames longer than 8 characters or containing spaces were automatically renamed, often cryptically. These problems were also corrected by hand.

In SPSS, inverted-value variables were transformed, data were inspected for other errors (through examination of outliers and frequency distributions), some variable types were corrected, missing value codes were added, new variables were constructed, and variable and value descriptors were added.

3. Construction of outcome measures. Constructed outcomes measures were used to gauge the effects of email frequency, closeness of match, and other factors that might contribute to successful mentoring. Following Peg Boyle Single's recommendation, we decided to create three different outcome constructs, focusing on **psychosocial**, **informational**, and **general** outcomes, as well as a (fourth) composite **total** outcome score. A preliminary set of variables for each construct was identified and discussed with Peg, then analyses were done to ensure that construct component variables were not too highly intercorrelated. Where intercorrelation was high, we made substitutions from similar items. All construct component variables were from the final questionnaire, and included a mix of "what did you discuss" booleans (yes/no; these were given a weight of two) and Likert-style process rating variables (range 1-5; these were given a weight of one). A description of the specific constructs follows:

OUT_PSYC (Psychosocial component of mentoring success): (Weight 2) A. Discussed balancing career and other interests, family, etc. B. Discussed managing time, stress, other workplace demands. C. Discussed social stuff: jokes, stories, personal news. (Weight 1) D. Sense that mentor was interested in me. E. Difficulty discussing something that is important to me.

OUT_INFO (Informational component of mentoring success): (Weight 2) A. Discussed industry workplace, culture. B. Discussed job hunting. C. Discussed differences between academia and industry. (Weight 1) D. Comfort asking mentor questions. E. Interest in working in industry.

OUT_GEN (General component of mentoring success): (All weights 1) A. Student-rated quality of the match. B. Experienced delays in receiving email reply from mentor {note: this and all other measures have been applied to the same scale, wherein 5=most positive response}. C. Interest in continuing in major next year.

OUT_TOTL (Overall mentoring success). Sum of above components. We simply added the three components, lacking any theoretical rationale for weighting them differentially or standardizing them (which would give them equal weights). The unweighted means were similar, ranging from 10.2 - 12.1.

4. Matching substudy using regression models. As noted in the body of the report (section "Matching Substudy"), regression analysis was used to assess the effects of aspects of the matching process on protégé and mentor outcomes. Data from several regression models are included in the accompanying SPSS output file, "Mnet_9899_tables.spo." in the section labeled, "MATCHING/Matching-related effects." The analyses in this output file are in thematic order, but within the MATCHING section, they are also numbered, 1-5b. The following is a brief summary of the findings in the table. A more detailed analysis is available on request.

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Table Number	Summary
1	Excluding manually matched pairs, there is a strong correlation between mentor and student match satisfaction, as measured on the final questionnaires. There is also strong agreement between MentorNet-calculated closeness-of-match scores for students and their mentors. (Closeness-of-match was computed at the time of matching using an algorithm that is described in a separate MentorNet memorandum written by Stephanie Fox, "98-99 Matching Protocol.doc.") However, there is not a significant correlation between closeness-of-match and student and mentor satisfaction with the match, nor is there apparently any relationship between IEG-computed closeness-of-field metrics and MentorNet-computed closeness-of-match measures. The latter is probably attributable to the contribution of other components of the matching algorithm, investigated in subsequent models.
2	A repeat of Model 1, with the addition of manually matched pairs to increase the sample size. MentorNet-computed closeness-of-fit measures were excluded as predictors, because they were not available for manually matched pairs. Results resemble those of Model 1.
3	This model substitutes IEG-computed closeness-of-career for closeness-of-field. Mentors were statistically more likely to be satisfied with the match when protégé and mentor had the same preferred career choice. There was no effect on student satisfaction with the match.
4	Regression to predict student match satisfaction, using all non-overlapping measures of field and career match (that is, we did not use the construct "matched student OR mentor" because it interacts statistically with "matched student only" and "matched mentor only." Student match satisfaction is independent of the hypothesized predictors.
5	Regression to predict mentor match satisfaction, using all non-overlapping measures of field and career match. Mentor match has one significant predictor, "matched both student and protégé's first career choice." Model 5b adds "undergraduate year" to the model, to determine whether the importance of matching on career varies by student year (e.g., freshmen vs. seniors). The predictor was not significant.

A series of regressions in the next section of the output file ("DYNAMICS OF MENTORING") examine the effects of matching-related and email frequency and responsiveness on other outcome constructs (besides "satisfaction with the match"). These models show that unlike closeness-of-match, frequency of email is a strong predictor of positive mentoring outcomes. One model in particular (Table 16) is interesting in that it shows that frequency of email is a strong predictor of positive outcomes even when the analysis is restricted to those individuals who reported that their frequency of email contact was "about right."

5. Check for nonresponse bias. In August, we conducted a check for nonresponse bias, to assess whether questionnaire nonrespondents differed from responders. Because we knew that students would be more difficult to reach (students did not provide telephone numbers in their original applications), we focused on the mentors. We identified a random sample of 30 mentors who did not complete the questionnaire and contacted them via email and, when necessary, by telephone. They were asked only two questions taken from the final questionnaire: the first question asked how many times per month they had received email

from their protégé; the other asked them to rate the overall quality of their match. (The first question was selected because the emails-received measure had been correlated with emails-sent—but does not ask mentors to report their own behavior—and because email frequency had been shown to be a predictor of overall mentoring success. The second question was selected to determine whether nonrespondents were less satisfied with their matches).

We reached 21 mentors. The email frequency rate reported by interviewees was virtually indistinguishable from the rate reported by mentors who completed the questionnaire (nonresponse sample mean = 1.83 emails/month, s.d. = 0.97, compared to the larger-group mean 1.89, s.d. = 1.05), but the match-satisfaction figure was somewhat lower than that reported by questionnaire-completers (mean 3.14, s.d.=1.20; versus mean 3.65, s.d. = 1.05 for the larger group). The latter difference is significant ($p<.05$). This suggests, not surprisingly, that there may be some positive bias in the overall questionnaire sample; that is, questionnaire respondents were more likely than nonrespondents to have had satisfactory mentoring experiences. This assessment is supported further by comparing the outcomes of protégés whose mentors completed the questionnaire ("P-M") with the outcomes of those who did not: ("P-0"). Mean protégé ratings of the quality of match and general and psychosocial outcomes were significantly higher for the P-M group than the P-0 group ($p<.05$). For example, quality-of-match ratings for the two groups were 4.13 vs. 3.62, a 12% difference.

In the case of the mentors, the 68% overall response rate for the final questionnaire is high enough that we can assume that questionnaire statistics are good estimates of the overall population, despite this sample bias. This may not be a safe assumption for protégés, from whom we had only a 51% response. We attempted to assess nonresponse bias among students using an email-only contact of a random sample of 35 students. As of late August, we had received usable responses from only 10 students. Four of our queries were bounced back immediately as undeliverable. We judged the sample too small from which to generalize, but we know that some of the universities do not resume classes until September, and we may be able to better assess protégé nonresponse bias in the early fall. In the meantime, we have done contrasts among the mentor-reported data between mentors whose protégés also responded (P-M) and mentors whose protégés did not (0-M). The two groups did appear to have significantly different outcomes. For example, the quality-of-match rating means for the two groups were 3.91 and 3.29, a 16% difference ($p<.01$, N=100 and 147, respectively). This suggests that protégé responses to the questionnaire may overestimate population outcomes.

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APPENDIX B: QUESTIONNAIRES

Four questionnaires were used in 1998-99:

mid99m	Midyear questionnaire, Mentors (45 items)
mid99s	Midyear questionnaire, Students (49 items)
final99m	Final questionnaire, Mentors (33 items)
final99s	Final questionnaire, Students (33 items)

An annotated copy of the final student online questionnaire follows. The actual instrument used color and differed somewhat in appearance, depending on the user's browser software. Variable names have been added for this report; in italics on the right side of the page. They did not appear on the questionnaire.

The names of some items differ between the "posted" questionnaire data and the final SPSS files if we did any transformation (e.g., to invert the order of items that run from "high" to "low"). The particular case of inversion transformations is noted with an asterisk next to the variable name.

The mentor and student questionnaires were similar, with some substitutions for items (e.g., "How interested are you … in continuing in your current major next year?") that made sense for only one group.

The midyear and final questionnaires were also similar, to facilitate tracking changes. One substantive difference concerned the list of discussion topics: the final questionnaire listed "topics that you discussed;" the midyear questionnaire had an additional checkbox for each topic to select if the respondent "planned to discuss" that topic.

For a complete listing of variables and definitions, please consult the codebook.

Final Questionnaire: MentorNet 1998-99 (Student version)

Thank you for your interest in MentorNet. Your confidential responses will be transmitted to the Ithaca Evaluation Group, and will be accessible only to the evaluators and MentorNet staff.

We ask for your name: (1) so you don't have to reenter basic demographics (your year in school, major, etc.); (2) so we can determine whether specific types of mentor-protégé matches work better than others; and (3) so we won't keep "inviting" you to complete this questionnaire. Completing the questionnaire will take 5-10 minutes.

Directions: Fill in the fields below, then click on the **Submit** button at the bottom of the form. If a question is not applicable to you, simply leave it blank.

		Variable name
First name		*sfirstna*
Last name		*slastnam*
Email address		*semail*

How comfortable were you:	**{Check one button in each row}**						
Asking your mentor questions?	Not at all ->	O	O	O	O	O	<-Very	*sask*
Responding to questions from your mentor?	Not at all ->	O	O	O	O	O	<-Very	*sans*
How interested are you now in:								
Continuing in your current major next year?	Not at all ->	O	O	O	O	O	<-Very	*smajor*
Working in industry after you graduate?	Not at all ->	O	O	O	O	O	<-Very	*swork*
Did you experience any of the following?								
Taking a long time to get back to your mentor	Often ->	O	O	O	O	O	<-Never	*s2resp*
Your mentor taking a long time to get back to you	Often ->	O	O	O	O	O	<-Never	*s2resto*
The sense that your mentor was interested in you	Often ->	O	O	O	O	O	<-Never	*s2inter**
Difficulty discussing something important to you	Often ->	O	O	O	O	O	<-Never	*s2im2me**
Please rate:								
The quality of the "match" between your mentor and you.	Excellent ->	O	O	O	O	O	<-Poor	*smatch**
How confident you are about your skills in your major field.	Not at all ->	O	O	O	O	O	<-Very	*sconf*
How often your mentor wrote to you.	Not enough ->	O	O	O	O	O	<-Too often	*soft*

* Variable inverted prior to analysis

What did you and your mentor discuss?

Topics	We discussed	Variable name
Your backgrounds (education, interests, etc.)		***sbackhav***
Balancing a career and other interests, family, etc.		***sbalahav***
Managing time, stress, or workplace demands		***stimehav***
College coursework, majors, or advanced degrees		***scollhav***
Industry workplace, culture, values		***senvthav***
Women's experiences at your mentor's company		***swomnhav***
Mentor's job, prior work experiences		***smjobhav***
Job hunting and interviewing		***shunthav***
Your future career plans		***spfuthav***
Your mentor's future career plans		***smfuthav***
Differences between academia and industry		***sdiffhav***
Your reasons for participating in MentorNet		***sreashav***
E-mentoring logistics (e.g., how often to write)		***slogihav***
Social stuff: jokes, stories, personal news		***sjokehav***

What were the most useful topics you discussed with your mentor?		***susefulto*** *In addition to the text field, up to four codes were added by evaluators:* ***susecod1...4***
What was the most valuable aspect of your email mentoring?		***svaluabl*** *In addition to the text field, up to four codes were added by evaluators:* ***svalcod1...4***
Please describe, in as much detail as possible, any specific positive outcomes of your mentoring experience.		***soutcome*** *In addition to the text field, up to four codes were added by evaluators:* ***soutcod1...4***

Approximately how often did you:

... Send email to your mentor? ___ times a month ***ssentnum***

... Receive email from your mentor? ___ times a month ***srecdnm***

APPENDIX C: SOLICITATION LETTERS

This is a sample of the letter sent to solicit participation in the email monitoring study. Protégé and mentor versions were slightly different, and human subjects contact information was modified to match the protégé's college or university.

To: JaneDoe@sjsu.edu
From: William S. Carlsen <itheval@itheval.com>
Subject: MentorNet evaluation invitation

Dear Jane,

I am writing concerning your participation in MentorNet. Electronic mentoring is still very new, and very little research or evaluation has been done about its effectiveness or even its nature. What do mentors and proteges discuss? Who initiates conversations? What kinds of matches work best?

MentorNet would like to learn more about the e-mentoring process so they can improve future training and coaching materials. They have hired us--the Ithaca Evaluation Group--to assist them with that goal, and IEG will be using a variety of strategies to try to describe the mentoring process, while doing everything we can to respect the nature and confidentiality of that process. For example, our work will include online and telephone interviews of a sample of participants later in the year. We are also inviting a random sample of this year's participants--including you and your mentor--to help us understand what happens substantively during email exchanges. To do this, we are asking you and your mentor to agree to copy us your e-mail correspondence with each other. If you agree to send us copies, we will log them onto a secure file server, then use qualitative research methods to content analyze the "conversations" that proteges and mentors have with each other.

To help ensure the confidentiality of your conversations:
a. Only IEG staff will have access to the email messages you forward (a listing of our staff and a description of our company can be found at http://www.itheval.com).
b. Only summary analyses and quotations will be sent to MentorNet, and these will be edited to ensure they contain no identifying information.
c. You may withdraw from this aspect of the program evaluation at any time.
d. The design of this monitoring process has been reviewed by your university's Committee on Human Subjects.

Most email programs can be configured so that when you send an email to your mentor, a copy will automatically go to the Ithaca Evaluation Group (e.g., using an outgoing mail "filter" in Eudora). Alternatively, you can simply manually "cc" us your outgoing MentorNet messages.

We do not believe there are any individual benefits or risks to you related to your participation. Please note that we will send further instructions to you only if both you AND your mentor agree to participate!

If you have any questions or concerns about the program evaluation, please do not hesitate to contact me (Dr. William S. Carlsen, carlsen@itheval.com), Peg (Dr. Peg Boyle, pboyle@email.sjsu.edu) or Serena Stanford, AVP of Graduate Studies, SJSU at (408) 924-2480.

Please let us know your decision by REPLYing to this message, giving one of the following three responses:

____ YES. I am willing to participate in this part of the program evaluation. If my mentor also agrees, please send me information about how to send email copies to the Ithaca Evaluation Group.

____ NO. I would prefer not to participate, even if my mentor agrees.

____ I NEED MORE INFORMATION. I have some questions or concerns. (Please include them in your message or give us a phone number and some suggested times to call you)

Thank you very much!
William S. Carlsen

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A sample of an initial invitation email (protégé version) for the final questionnaire is provided below, for a fictional participant.

To: "Danica Jones"<danica@somecollege.edu>
From: William S. Carlsen <itheval@itheval.com>
Subject: MentorNet 98-99 Final Evaluation

Dear Danica,

I am writing to request your assistance once again in evaluating the MentorNet program. Would you be willing to complete a very brief (5-10 minute) online questionnaire about your experience in the program? Your responses will be confidential and will be accessible only to MentorNet staff and to consultants at our small evaluation firm.

Please fill out the questionnaire by clicking on (or pointing your browser to) http://www.itheval.com/ final99s.html

If you would prefer not to participate in the final evaluation, please email us so we do not follow up with a reminder.

If you have any questions about the evaluation, please feel free to query us or MentorNet staff at San Jose State University. Peg Boyle Single's email address is pboyle@email.sjsu.edu.

Thank you!

William S. Carlsen, PhD

Ithaca Evaluation Group
http://www.itheval.com

APPENDIX D: EXPERIMENTAL EVALUATION OF AN ADAPTIVE PROMPTING SYSTEM

An "adaptive prompting system" would tailor the amount and kind of MentorNet-provided email prompting, depending on the needs of participants. A mentoring partnership of a taciturn freshman and a novice mentor might need and welcome periodic email prompts—especially ones that were tailored to the interests of younger college students (e.g., choosing a major, finding a summer job). On the other hand, a partnership between an outgoing senior and an experienced mentor might find such prompting unnecessary, even distracting.

Prior to developing and implementing such a system it would be useful to evaluate its potential utility, assuming that periodic email prompting is planned for 1999-2000 participants. This could be done in simplified fashion via a fairly simple experiment:

1. At the beginning of the year, randomly select an experimental group of approximately 150 pairs from the entire population of 1000 matched pairs (if the sample were random, it would undoubtedly include a range of participant characteristics, including prior ementoring experience). Flag these individuals in the main MentorNet database using one of the fields used to address email prompting messages.
2. Do not send periodic email prompts to these individuals. Five weeks after assigning matches, send experimental group protégés an email with a series of suggested benchmarks for their mentoring so far, e.g.: number of emails swapped, exchange of brief professional profiles, one cycle of mentor question/student response, and one cycle of student question/mentor response. Protégés could be advised that if they are satisfied with the mentoring process so far, fine, they need do nothing. However, if they are not, or if they'd like some help in keeping the mentoring process rolling, they should click on a hypertext link embedded in the email, which will redirect them to a MentorNet web page for assistance. (Note: this and all other messages directing participants to data collection sites should remind the recipient of their MentorNet ID number, which is used to find their record).
3. We estimate that relatively few protégés will elect this option (wild guess: 20-30), but they are an important subgroup. The web page to which they would be directed would be a simple form with some indicator questions: Have you emailed your mentor? Have you heard back from him or her? Do you feel like you or your mentor could use some suggestions for conversational topics?
4. For about one week after sending the protégé prompt, the MentorNet mentoring specialist would monitor responses from students and take one of the following actions: (1) handle non-initiation of mentoring dialogues the same way the program currently handles non-initiation complaints (e.g., by querying the mentor and following up a few days later with the protégé); (2) handle requests for suggestions about conversational topics by simply emailing respondents (and their mentors) the prompts that had been withheld because they were in the experimental group, plus change their status so that they and their mentors would receive future prompts; and (3) handle non-response by continuing the experimental treatment (no email prompts).
5. Approximately two weeks later, query all of the experimental group mentors in a similar fashion. We estimate that a somewhat larger number of mentors is likely to respond (perhaps 30-40). Handle in a manner similar to that described for protégés in #4 above.
6. (Optional) Execute a second cycle of this type of inquiry in February, when we know some mentoring dialogues begin to flag.
7. At the end of the year, contrast the experiences of experimental group participants with the rest of the population.